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Investigating charge carrier effects in silicon membranes using fs laser.

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Abstract content
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The second harmonic (SH) generated at the Si/SiO2 interface varies on a time scale of several seconds when illuminated with high intensity near infrared laser pulse ($\lambda = 800$ nm, with 80 MHz frequency, Epulse ≤ 10 nJ). The temporal behaviour arises from generation of trap sites and subsequent trapping of charges at the interface via multi-photon processes. These trapped charges create an interfacial electric field which influences the nonlinear properties of the Si/SiO2 interface and leads to a time dependent second harmonic (TDSH) signal on continuous irradiation. This is known as electric field induced second harmonic (EFISH) generation. In this work, measurements are focused on the simultaneous measurements of EFISH signal from a free standing oxidized Si membrane both in reflection and transmission as a function of the irradiation time. Results show that the transmission of the fundamental irradiation as well as the transmitted SH signal generated from the Si membrane increases, reaches a maximum, and then decreases again as the input intensity is increased. The nonlinear behaviour of the transmitted signal is explained using free charge carrier absorption (FCA) in silicon.

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PhD

Main supervisor (name and email)
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